

Mathematics: Spotlight on Equity Resources

The Spotlight on Equity includes a list of considerations for the purpose of providing an equity literate and socially conscious lens to the teaching and learning of mathematics, as well as recognizing the historic exclusion and marginalization of groups and communities. The Vermont Agency of Education (AOE) is committed to improving the learning of every student by ensuring that educational equity is at the center of all decision-making. The AOE defines [educational equity](#) to mean that every student has access to the resources, opportunities,, and educational rigor they need at the right moment in their education, whatever their race, gender/identity, sexual orientation, ethnicity, religion, language, disability, family background, or family income may be. This view is supported by the National Council of Teachers of Mathematics (NCTM) in their position statement on [Access and Equity in Mathematics Education](#).

The late Bob Moses, the founder of the [Algebra Project](#), stated that “in today’s world, economic access and full citizenship depend crucially on mathematics and scientific literacy.” Mathematics is often referred to as a “universal language.” However, it cannot be universal when it is presented from a single cultural perspective. To be truly universal, educators must understand that [students come with different cultural backgrounds](#) and enter the teaching and learning process with their own cultural thinking and processing styles when doing mathematics.

To be engaged with a curriculum, a student must be able to see themselves in the content being presented. Teaching mathematics from a culturally responsive and sustaining perspective is crucial in providing equity for all students. The following considerations are not a complete list, but rather a starting point from which educators can design culturally sustaining learning opportunities in mathematics.

Feedback on the draft versions of the Spotlights on Equity was solicited from the field between October 11th and November 22nd of 2021. A link to a Cognito form with focus questions created by content specialists at the Vermont Agency of Education was sent out through their networks. Additionally, feedback was requested from members of the Vermont Curriculum Leaders Association (VTCLA), the Equity Literacy and Equitable Education Systems grant awardees, the Vermont Foreign Language Association, the Vermont Principals Association, and the chairperson of the Act 1 Advisory Working Group. Thirty-two educators submitted feedback that was used to improve and refine the draft documents.

General Resources

The following resources apply to all domains of mathematics and help provide insight for educators to teach mathematics from a culturally responsive and sustaining lens.

Contact Information:

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Resources	Why it Matters
<p>NCTM Equitable Mathematics Teaching Practices</p> <p><i>Contains descriptions for each of the eight mathematics teaching practices articulated by the NCTM, along with consideration for the equitable teaching of those practices.</i></p>	<p>Teachers build students’ mathematical identities when they use teaching practices effectively to position students as mathematically competent by creating opportunities for them to demonstrate agency and efficacy (from Catalyzing Change, NCTM).</p>
<p>NCTM Access and Equity in Mathematics</p> <p><i>Provides links to the position statement on access and equity in mathematics from the National Council of Teachers of Mathematics (NCTM).</i></p>	<p>When access and equity have been successfully addressed, student outcomes—including achievement on a range of mathematics assessments, disposition toward mathematics, and persistence in the mathematics pipeline—transcend expectations, and cannot be predicted by students’ racial, ethnic, linguistic, gender, and socioeconomic backgrounds.</p>
<p>Equitable Mathematics Teaching Practices Proficiency Scale</p> <p><i>Identifies proficiency scales for each of the mathematics teaching practices being used by educators to support the improvement of teaching practices.</i></p>	<p>This tool allows educators to self-assess their proficiency in implementing the NCTM’s eight mathematics teaching practices to guide and support continuous improvement.</p>
<p>Dismantling Racism in Mathematics Instruction</p> <p><i>Contains exercises for educators to use to reflect on their own biases and transform their instructional practice.</i></p>	<p>This framework provides teachers an opportunity to examine their actions, beliefs, and values around teaching mathematics.</p>
<p>A case for rich math tasks: Equity for students</p> <p><i>Focuses on using the math practice of Implement Tasks that Promote Reasoning and Problem Solving to create equity in the mathematics classroom.</i></p>	<p>Creating equity in the mathematics classroom ensures that all students, regardless of their race, income, or where they live, are well prepared for life, college, and career.</p>
<p>How Do I Teach Mathematics in a Culturally Responsive Way?</p> <p><i>Identifies empowering practices that support the teaching of mathematics in a culturally responsive manner.</i></p>	<p>Mathematics has been called a “universal language” that is devoid of a particular culture, however, when mathematics is taught from the perspective of the dominant culture many other cultures suffer. This paper presents research that shows positive gains in mathematics proficiency among marginalized populations when they are taught through the cultural lens that they bring to the learning environment.</p>
<p>8 Characteristics of an Equitable Mathematics Classroom</p> <p><i>Provides characteristics of what an equitable mathematics classroom looks like in practice.</i></p>	<p>These characteristics are provided to help teachers ensure that as they prepare for the teaching of “everyone,” that they maintain high expectations for all, and avoid sacrificing excellence which results in opportunities for no one.</p>

Resources	Why it Matters
<p>Oregon Math Project: Meaningful Math for Every Student</p> <p><i>Provides several resources and other documents that highlight the Oregon Math Project, and their vision to make mathematics relevant and equitable for all students.</i></p>	<p>The Oregon Math Project outlines their state’s plan to increase student mathematics achievement through implementation of applied mathematics problems and to decrease the mathematics achievement gap between historically underserved students and their peers through implementation of applied mathematics problems. Their vision focuses on the practices of classroom discourse, mathematical modeling, promoting equity, and removing tracking.</p>
<p>Community Based Mathematics Project</p> <p><i>Contains lesson plans aligned with the Common Core State Standards in Mathematics (CCSS-M) that are designed to be locally relevant resource to support any math curriculum. Lessons can be searched by CCSS-M domain, grade, and context. Although these lessons were developed to reflect urban Philadelphia, they can easily be adapted to fit the Vermont context.</i></p>	<p>The Community Based Mathematics Project, founded at the University of Pennsylvania in 2009, helps develop locally relevant and social justice-oriented curriculum and pedagogy that consider the contexts of students’ lives, what they know and are interested in, and the social realities and issues that matter to them. Lessons are designed with a focus on inquiry to engage students in productive struggle with core mathematical ideas. One of the main goals of the project is to improve students’ access to and engagement with mathematics.</p>

Resources by Graduation and/or Critical Proficiency

The following resources focus on various domains of mathematics, which align with many critical and/or graduation proficiencies seen in Vermont schools:

Graduation and/or Critical Proficiency	Resources	Why it Matters
<p>Modeling:</p> <p><i>Use mathematics to help make sense of the real world: identify variables, formulate a model describing the relationship between the variables, interpret results, and validate and report conclusions and reasoning.</i></p>	<p>Mathematical Modeling and Culturally Relevant Pedagogy</p> <p><i>This article provides ideas that educators can use to consider contexts that are relevant to students’ lives for creating mathematical modeling tasks and focuses on the tenets of Culturally Relevant Pedagogy (CRP).</i></p>	<p>Students’ cultural backgrounds can play a central role within rich modeling activities, which ask students to create problem-solving methods for tasks in everyday contexts. These opportunities have the potential for teachers to leverage diverse students’ everyday lived experiences for meaningful engagement with challenging mathematics through modeling tasks.</p>

Graduation and/or Critical Proficiency	Resources	Why it Matters
<p>Number and Quantity: <i>Reason, describe, and analyze quantitatively, using units and number systems to solve problems.</i></p>	<p><u>Can I Be a Multicultural Educator in Math - Ethnomathematics</u> <i>This site shares ways in which an educator can present mathematics from a multicultural perspective using Ethnomathematics, which invites us to investigate how knowledge was built throughout history in different cultural environments.</i></p>	<p>Understanding mathematics from a multicultural perspective is important because culture and context can have deep and consequential effects on perceived math proficiency.</p>
<p>Algebra: <i>Create, interpret, use, and analyze expressions, equations, and inequalities.</i></p>	<p><u>Teaching Algebra Using Project-Based Learning</u> <i>This site provides a rationale for teaching algebra concepts through project-based learning, discusses how to plan for project-based learning, and contains links for further readings.</i></p>	<p>Incorporating projects based on algebraic problem-solving skills provide an opportunity for collaborative efforts that engage student teams and encourage a joint effort that can be used to reinforce learning in a more engaging manner than rote memorization.</p>
<p>Functions: <i>Use functions, including linear, quadratic, trigonometric, and exponential, to interpret and analyze a variety of contexts.</i></p>	<p><u>Teaching and Learning Functions</u> <i>This chapter from the National Academies Press details the importance of assessing students' prior knowledge regarding functions and using their own language to describe functions in order to enable students to gain a deeper understanding of formal mathematical concepts.</i></p>	<p>Functional relationships between quantities exist all around us. As these relationships become more complex, algebraic tools allow for these relationships to be examined efficiently. Students are better able to understand and explain new ideas when they progress from thinking about those ideas using their own invented or natural language to thinking about them using formal conventional terms.</p>
<p>Geometry: <i>Understand geometric concepts and constructions, prove theorems, and apply appropriate results to solve problems.</i></p>	<p><u>Geometry in the Middle Grades: A Multicultural Approach</u> <i>This study used a multicultural approach to Geometry instruction to increase student engagement and enjoyment; the link to the <u>full dissertation</u> includes 18 geometry lessons created using a multicultural approach.</i></p>	<p>Students appreciate the contributions of cultures that are different from their own and linking mathematics to other disciplines and cultures provides more meaning to the mathematics being studied.</p>

Graduation and/or Critical Proficiency	Resources	Why it Matters
<p>Statistics:</p> <p><i>Interpret and apply statistics and probability to analyze data, reach and justify conclusions, and make inferences.</i></p>	<p><u>Culturally Relevant Statistics</u></p> <p><i>This paper describes a project that was based on the principles of culturally relevant pedagogy to create conditions where students themselves would recognize the relevance of statistics in identifying and describing inequities that face their communities.</i></p>	<p>Understanding statistics allows students to make more informed decisions about the world around them. Students benefit from reasoning about the aggregate and generalizing from data, rather than from individual data points.</p>

Additional Vermont Agency of Education Resources

[Cultural Diversity and Equity Resources - June 2020](#)

[Educational Equity Webpage](#)

[Equity Literacy Resources – Fall 2019](#)

[Equity Literacy Resources – Spring 2019](#)